RF TEST REPORT

For

SensoScientific, Inc.

Product Name: SubG Gateway

Model(s).: SG-G00

Report Reference No.	:	**POCE230727155BRW**
FCC ID	:	**2BAJL-SGG00KOTA**
Applicant's Name	:	SensoScientific, Inc.
Address	:	685 COCHRAN ST STE 200 SIMI VALLEY CA 93065
Testing Laboratory	:	Shenzhen POCE Technology Co., Ltd.
Address	:	102 Building H1 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Test Specification Standard	:	**47 CFR Part 15.247** **ANSI C63.10-2013 & KDB 558074 D01 Meas Guidance v05r02**
Date of Receipt	:	July 10, 2023
Date of Test	:	July 10, 2023 to July 27, 2023
Data of Issue	:	July 27, 2023
Result	:	**Pass**

Note: This report shall not be reproduced except in full, without the written approval of Shenzhen POCE Technology Co., Ltd. This document may be altered or revised by Shenzhen POCE Technology Co., Ltd. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample

Revision History Of Report

Version	Description	REPORT No.	Issue Date
V1.0	Original	POCE230727155BRW	July 27, 2023

NOTE1:

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

Compiled by:	Supervised by:	Approved by:
Amy Zhu	Stone Yin	Machael Mo
Amy Zhu / File administrators	Stone Yin / Technique principal	Machael Mo / Manager

CONTENTS

1 TEST SUMMARY 5
1.1 TEST STANDARDS 5
1.2 SUMMARY OF TEST RESULT 5
2 GENERAL INFORMATION 6
2.1 CLIENT INFORMATION 6
2.2 DESCRIPTION OF DEVICE (EUT) 6
2.3 DESCRIPTION OF TEST MODES 7
2.4 DESCRIPTION OF SUPPORT UNITS 7
2.5 EQUIPMENTS USED DURING THE TEST 8
2.6 STATEMENT OF THE MEASUREMENT UNCERTAINTY 9
2.7 IDENTIFICATION OF TESTING LABORATORY 9
2.8 ANNOUNCEMENT 9
3 EVALUATION RESULTS (EVALUATION) 10
3.1 ANTENNA REQUIREMENT 10
3.1.1 Conclusion: 10
4 RADIO SPECTRUM MATTER TEST RESULTS (RF) 11
4.1 CONDUCTED EMISSION AT AC POWER LINE 11
4.1.1 E.U.T. Operation: 11
4.1.2 Test Setup Diagram: 11
4.1.3 Test Data: 12
4.2 OCCUPIED BANDWIDTH 14
4.2.1 E.U.T. Operation: 14
4.2.2 Test Setup Diagram: 15
4.2.3 Test Data: 15
4.3 MAXIMUM CONDUCTED OUTPUT POWER 16
4.3.1 E.U.T. Operation: 16
4.3.2 Test Setup Diagram: 16
4.3.3 Test Data: 16
4.4 POWER SPECTRAL DENSITY 18
4.4.1 E.U.T. Operation: 18
4.4.2 Test Setup Diagram: 18
4.4.3 Test Data: 18
4.5 EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS 19
4.5.1 E.U.T. Operation: 19
4.5.2 Test Setup Diagram: 19
4.5.3 Test Data: 19
4.6 BAND EDGE EMISSIONS (RADIATED) 20
4.6.1 E.U.T. Operation: 20
4.6.2 Test Setup Diagram: 20
4.6.3 Test Data: 21
4.7 EMISSIONS IN RESTRICTED FREQUENCY BANDS (BELOW 1GHZ) 23
4.7.1 E.U.T. Operation: 23
4.7.2 Test Setup Diagram: 23
4.7.3 Test Data: 24
4.8 EMISSIONS IN RESTRICTED FREQUENCY BANDS (ABOVE 1GHZ) 27
4.8.1 E.U.T. Operation: 27
4.8.2 Test Setup Diagram: 27
4.8.3 Test Data: 28
5 TEST SETUP PHOTOS 29

6 PHOTOS OF THE EUT 31
APPENDIX 38
1.1 -6dB BANDWIDTH 39
1.2 99% OCCUPIED BANDWIDTH 41
1.3 BANDEDGE 43
1.4 PEAK OUTPUT POWER 45
1.5 POWER SPECTRAL DENSITY 47
1.6 SPURIOUS EMISSION 49

1 TEST SUMMARY

1.1 Test Standards

The tests were performed according to following standards:

47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

1.2 Summary of Test Result

Item	Standard	Requirement	Result
Antenna requirement	47 CFR Part 15.247	47 CFR 15.203	Pass
Conducted Emission at AC power line	47 CFR Part 15.247	47 CFR 15.207(a)	Pass
Occupied Bandwidth	47 CFR Part 15.247	47 CFR 15.247(a)(2)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	47 CFR 15.247(b)(3)	Pass
Power Spectral Density	47 CFR Part 15.247	47 CFR 15.247(e)	Pass
Emissions in non-restricted frequency bands	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Band edge emissions (Radiated)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (below 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (above 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass

Note: 1.N/A -this device(EUT) is not applicable to this testing item
2. RF-conducted test results including cable loss.

2 GENERAL INFORMATION

2.1 Client Information

Applicant's Name : SensoScientific, Inc.

Address : 685 COCHRAN ST STE 200 SIMI VALLEY CA 93065

Manufacturer : Vietnam IBE Laser Co.,ltd

Address : Lot CN-34 and CN-39, Thuan Thanh II Industrial Park, An Binh Ward and, Mao Dien Commune, Thuan Thanh Town, Bac Ninh Province, Vietnam.

2.2 Description of Device (EUT)

Product Name:	SubG Gateway
Sample number:	230710155
Model/Type reference:	SG-G00
Series Model:	N/A
Model Difference:	N/A
Trade Mark:	SensoScientific
Product Description:	SubG Gateway
HW/SW:	94V-0/V1.0
Operation Frequency:	2402MHz –2480MHz
Number of Channels:	40
Modulation Type:	GFSK
Antenna Type:	PCB ANTENNA
Antenna Gain:	0dBi
Power Supply:	DC5.0V-1A
Adapter :	/

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402 MHz	11	2422 MHz	21	2442 MHz	31	2462 MHz
2	2404 MHz	12	2424 MHz	22	2444 MHz	32	2464 MHz
3	2406 MHz	13	2426 MHz	23	2446 MHz	33	2466 MHz
4	2408 MHz	14	2428 MHz	24	2448 MHz	34	2468 MHz
5	2410 MHz	15	2430 MHz	25	2450 MHz	35	2470 MHz
6	2412 MHz	16	2432 MHz	26	2452 MHz	36	2472 MHz
7	2414 MHz	17	2434 MHz	27	2454 MHz	37	2474 MHz
8	2416 MHz	18	2436 MHz	28	2456 MHz	38	2476 MHz
9	2418 MHz	19	2438 MHz	29	2458 MHz	39	2478 MHz
10	2420 MHz	20	2440 MHz	30	2460 MHz	40	2480 MHz

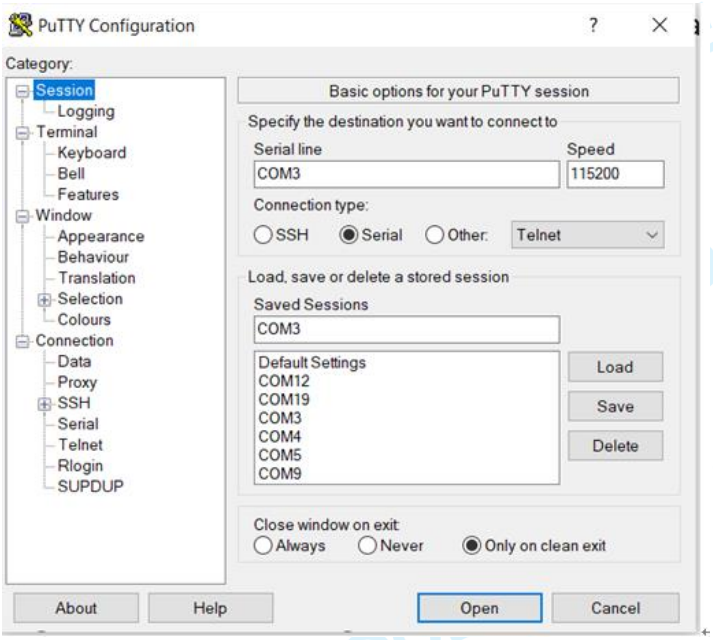
Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Test channel	**Frequency (MHz)**
	BLE
Lowest channel	2402MHz
Middle channel	2440MHz

Highest channel	2480MHz

2.3 Description of Test Modes

No	Title	Description
TM1	TX-GFSK	Keep the EUT works in continuously transmitting mode with GFSK modulation.
		☒Special software is used. ☐Through engineering command into the engineering mode. engineering command: *#*#3646633#*#*
		Special software: 

2.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Description	Manufacturer	Model No.	Remark	Certification
1	Adapter	PHOTON	ATXC-069AC65B	Provide by lab	SDOC

2.5 Equipments Used During The Test

Conducted Emission at AC power line					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal. Due Date**
Shielding room	CY	8*4*3	20160102	2023/1/26	2025/1/25
Pulse Limiter	Schwarzbeck	VTSD 9561	561-G071	2023/2/27	2024/2/26
Cable	Schwarzbeck	/	/	2023/2/27	2024/2/26
Test Receiver	Rohde & Schwarz	ESPI	1164.6607K03-102109-MH	2023/6/13	2024/6/12
L.I.S.N	R&S	ESH3-Z5	831.5518.52	2022/12/29	2023/12/28
L.I.S.N	Schwarzbeck	NSLK 8126	NSLK 8126	/	/
50ΩCoaxial Switch	Anritsu	MP59B	M20531	/	/
EMI Testsoftware	Farad	EZ -EMC	V1.1.42	/	/

Emissions in restricted frequency bands and RF					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Test Receiver	R&S	ESCI	102109	2023/6/13	2024/6/12
Spectrum Analyzer	R&S	FSP30	1321.3008K40-101729-jR	2023/6/14	2024/6/13
966 Chamber	CY	9*6*6	20160101	2023/1/26	2025/1/25
Bore-sighting Antenna rack	PBB	1308503	16033	/	/
Loop antenna	ZHINAN	ZN30900C	ZN30900C	2021/7/5	2024/7/4
Broadband Antenna	Sunol Sciences	JB6 Antenna	A090414	2023/5-21	2025/5-20
Horn Antenna	Sunol Sciences	DRH-118	A091114	2023/5/13	2025/5/12
Horn antenna	COM-POWER	AH-1840(40G)	10100008	2023/4/5	2025/4/4
Power APM(LF)	Schwarzbeck	BBV9743	9743-151	2023/6/13	2024/6/12
Power APM(HF)	Schwarzbeck	BBV9718	9718-282	2023/6/13	2024/6/12
Cable(LF)#2	Schwarzbeck	/	/	2023/2/27	2024/2/26
Cable(LF)#1	Schwarzbeck	/	/	2023/2/27	2024/2/26
Cable(HF)#2	Schwarzbeck	AK9515E	96250	2023/2/28	2024/2/27
Cable(HF)#1	Schwarzbeck	SYV-50-3-1	/	2023/2/27	2024/2/26
Power divider	MIDEWEST	PWD-2533	SMA-79	2023/5/11	2026/5/10
signal generator	Keysight	N5181A	MY48180415	2022/12/10	2023/12/9
signal generator	Keysight	N5182A	MY50143455	2022/12/29	2023/12/28
Wideband radio communication tester	R&S	CMW500	113410	2023/6/13	2024/6/12
Spectrum Analyzer	Keysight	N9020A	MY53420323	2022/12/29	2023/12/28
RF Sensor Unit	TACHOY	TR1029-2	000001	/	/
RF Control Unit	TACHOY	TR1029-1	000001	/	/
Position Controller	MF	MF-7802	/	/	/
EMI Testsoftware	Farad	EZ -EMC	V1.1.42	/	/
RF TestSoftware	TACHOY	RTS-01	V2.0.0.0	/	/

2.6 Statement Of The Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Disturbance (0.15~30MHz)	±3.41dB
Occupied Bandwidth	±3.63%
RF conducted power	±0.733dB
RF power density	±0.234%
Conducted Spurious emissions	±1.98dB
Radiated Emission (Above 1GHz)	±5.46dB
Radiated Emission (Below 1GHz)	±5.79dB
Note: (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

2.7 Identification of Testing Laboratory

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252

Identification of the Responsible Testing Location

Company Name:	Shenzhen POCE Technology Co., Ltd.
Address:	101-102 Building H5 & 1/F., Building H, Hongfa Science & Technology Park, Tangtou, Shiyan, Bao'an District, Shenzhen, Guangdong, China
Phone Number:	+86-13267178997
Fax Number:	86-755-29113252
FCC Registration Number:	0032847402
Designation Number:	CN1342
Registration Number:	778666
A2LA Certificate Number:	6270.01

2.8 Announcement

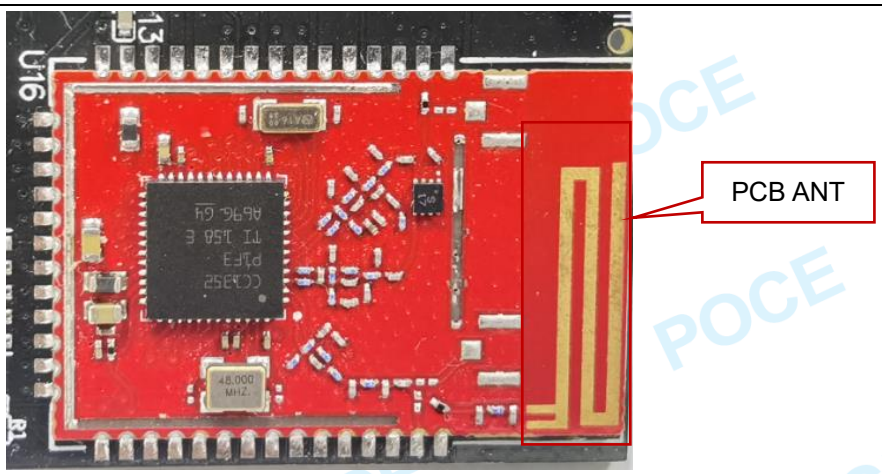
(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by POCE and all revisions are duly noted in the revisions section.
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

3 Evaluation Results (Evaluation)

3.1 Antenna requirement

Test Requirement:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.1.1 Conclusion:



4 Radio Spectrum Matter Test Results (RF)

4.1 Conducted Emission at AC power line

Test Requirement:	Refer to 47 CFR 15.207(a), Except as shown in paragraphs (b)and (c)of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).
Test Limit:	

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

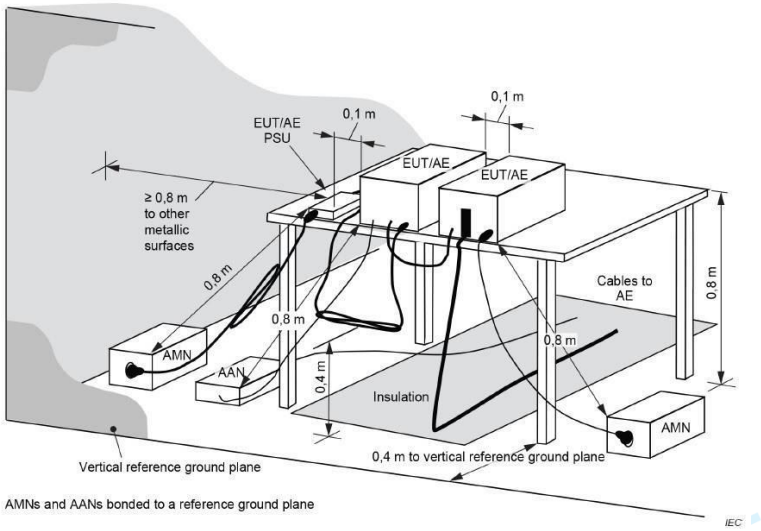
*Decreases with the logarithm of the frequency.

Test Method:	ANSI C63.10-2013 section 6.2
Procedure:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.1 E.U.T. Operation:

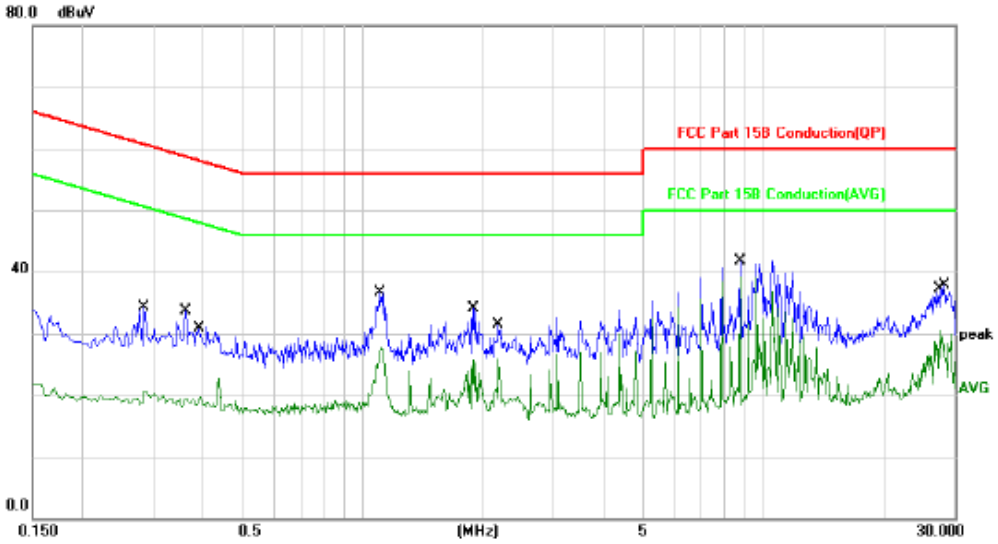
Operating Environment:					
Temperature:	25.6 °C	Humidity:	56.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.1.2 Test Setup Diagram:



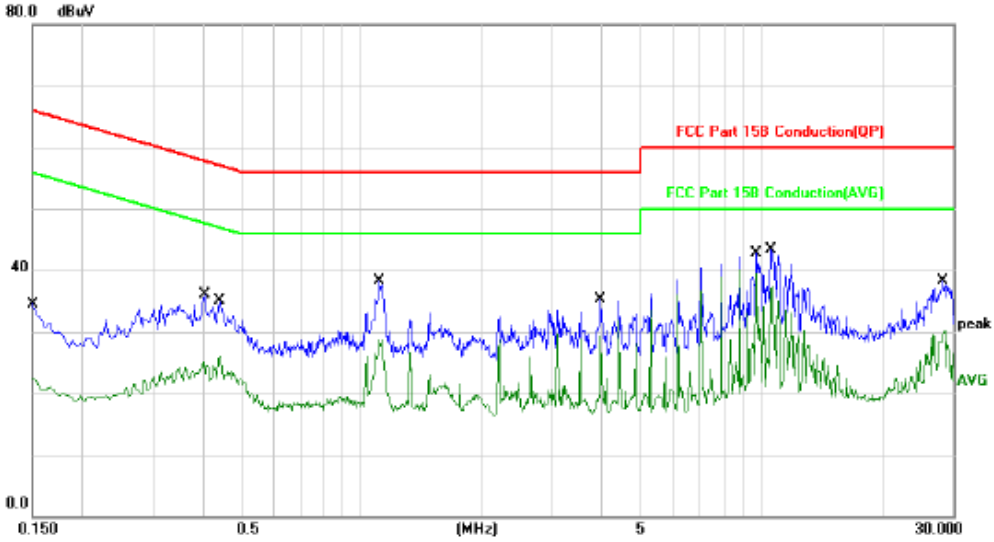
4.1.3 Test Data:

TM1 / Line: Line / Band: 2.4G / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2860	13.56	20.71	34.27	60.64	-26.37	QP	
2		0.2860	0.01	20.71	20.72	50.64	-29.92	AVG	
3		0.3620	13.07	20.68	33.75	58.68	-24.93	QP	
4		0.3940	-0.98	20.67	19.69	47.98	-28.29	AVG	
5		1.1060	16.02	20.73	36.75	56.00	-19.25	QP	
6		1.1140	6.94	20.73	27.67	46.00	-18.33	AVG	
7		1.8940	13.30	20.76	34.06	56.00	-21.94	QP	
8		2.1860	5.13	20.79	25.92	46.00	-20.08	AVG	
9		8.7620	20.20	21.50	41.70	60.00	-18.30	QP	
10	*	8.7620	17.87	21.50	39.37	50.00	-10.63	AVG	
11		27.4500	6.22	24.28	30.50	50.00	-19.50	AVG	
12		28.3700	13.51	24.39	37.90	60.00	-22.10	QP	

TM1 / Line: Neutral / Band: 2.4G / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	14.00	20.60	34.60	65.99	-31.39	QP	
2		0.1500	1.91	20.60	22.51	55.99	-33.48	AVG	
3		0.4060	15.38	20.66	36.04	57.73	-21.69	QP	
4		0.4420	5.36	20.65	26.01	47.02	-21.01	AVG	
5		1.1100	17.47	20.73	38.20	56.00	-17.80	QP	
6		1.1100	7.88	20.73	28.61	46.00	-17.39	AVG	
7		3.9620	14.44	20.84	35.28	56.00	-20.72	QP	
8		3.9620	8.45	20.84	29.29	46.00	-16.71	AVG	
9	*	9.6820	17.93	21.63	39.56	50.00	-10.44	AVG	
10		10.5620	21.53	21.78	43.31	60.00	-16.69	QP	
11		28.3740	13.88	24.39	38.27	60.00	-21.73	QP	
12		28.7420	5.94	24.43	30.37	50.00	-19.63	AVG	

Note:
1.An initial pre-scan was performed on the line and neutral lines with peak detector.
2.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3.Mesurement Level = Reading level + Correct Factor, Over=Limit- Mesurement

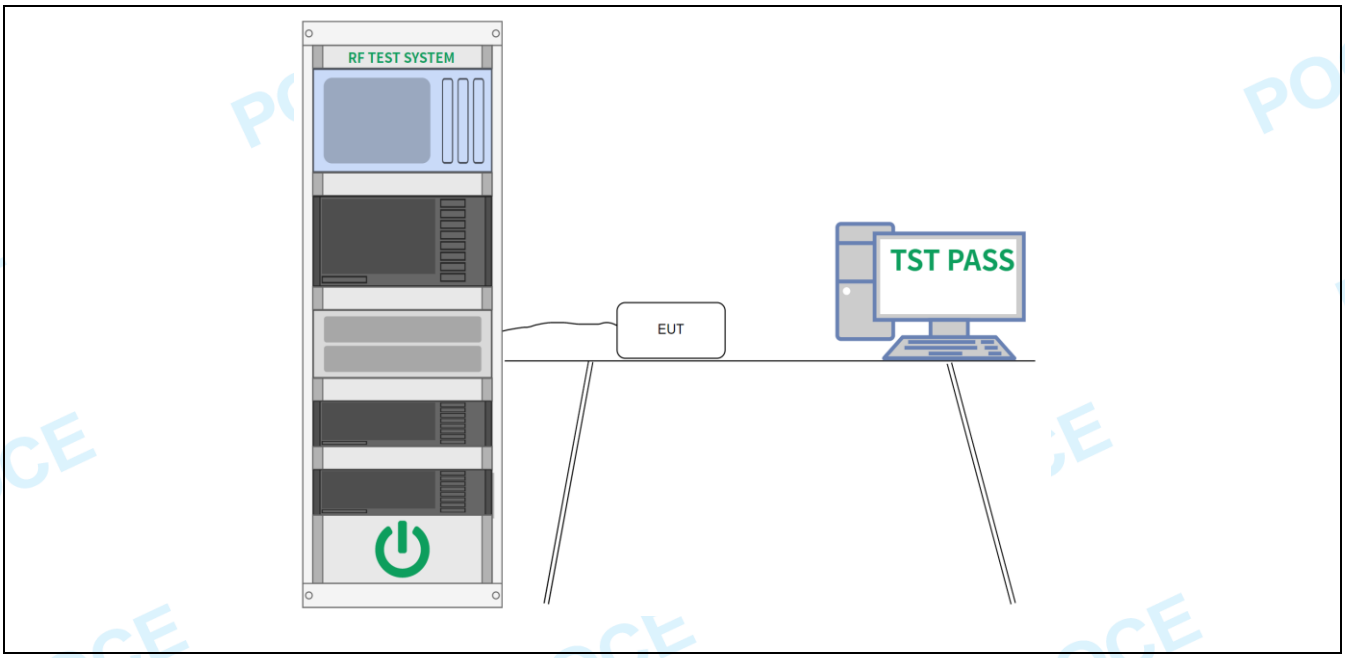
4.2 Occupied Bandwidth

Test Requirement:	47 CFR 15.247(a)(2)
Test Limit:	Refer to 47 CFR 15.247(a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	ANSI C63.10-2013, section 11.8 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	11.8.1 Option 1 The steps for the first option are as follows: a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz. b) Set the VBW ≥ [3 × RBW]. c) Detector = peak. d) Trace mode = max-hold. e) Sweep = No faster than coupled (auto) time. f) Allow the trace to stabilize. g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the "−6 dB down amplitude". If a marker is below this "−6 dB down amplitude" value, then it shall be as close as possible to this value. 11.8.2 Option 2 The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW ≥ 3 × RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

4.2.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.2.2 Test Setup Diagram:



4.2.3 Test Data:

Please Refer to Appendix for Details.

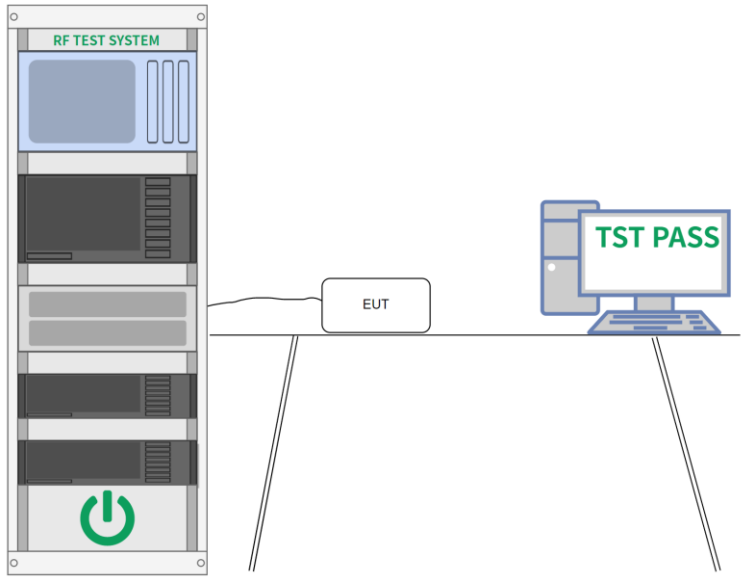
4.3 Maximum Conducted Output Power

Test Requirement:	47 CFR 15.247(b)(3)
Test Limit:	Refer to 47 CFR 15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method:	ANSI C63.10-2013 section 11.9.1 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013, section 11.9.1 Maximum peak conducted output power

4.3.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.3.2 Test Setup Diagram:



4.3.3 Test Data:

Please Refer to Appendix for Details.

Note:
Per ANSI C63.10-2013, if there are two or more antnnas, the conducted powers at Core 0, Core 1,…, Core i were first measured separately, as shown in the section above(this product olny have one antenna). The measured values were then summed in linear power units then converted back to dBm.

Per ANSI C63.10-2013 Section 14.4.3.2.3, the directional gain is calculated using the following formula, where GN is the gain of the nth antenna and NANT, the total number of antennas used.
For correlated unequal antenna gain
Directional gain = 10*log[(10G1/20 + 10G2/20 + … + 10GN/20)2 / NANT] dBi

For completely uncorrelated unequal antenna gain
Directional gain = 10*log[(10G1/10 + 10G2/10 + … + 10GN/10)/ NANT] dBi

Sample Multiple antennas Calculation: Core 0 + Core 1 +…Core i. = MIMO/CDD
(i is the number of antennas)
(#VALUE! mW + mW) = #VALUE! mW = dBm

Sample e.i.r.p. Calculation:
e.i.r.p. (dBm) = Conducted Power (dBm) + Ant gain (dBi)

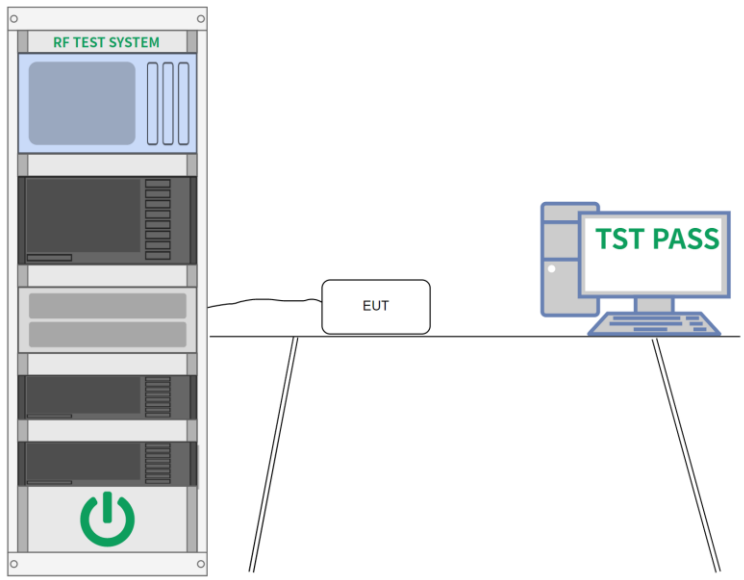
4.4 Power Spectral Density

Test Requirement:	47 CFR 15.247(e)
Test Limit:	Refer to 47 CFR 15.247(e), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	ANSI C63.10-2013, section 11.10 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013, section 11.10, Maximum power spectral density level in the fundamental emission

4.4.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.4.2 Test Setup Diagram:



4.4.3 Test Data:

Please Refer to Appendix for Details.

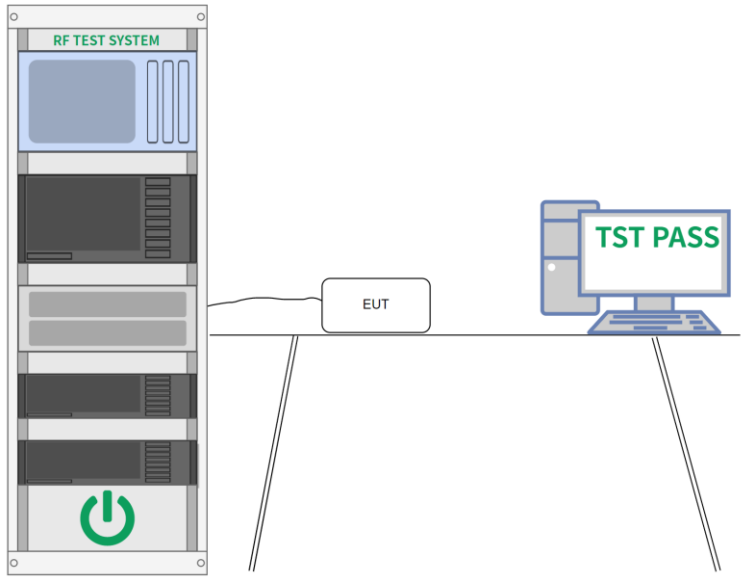
4.5 Emissions in non-restricted frequency bands

Test Requirement:	47 CFR 15.247(d)
Test Limit:	Refer to 47 CFR 15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required.
Test Method:	ANSI C63.10-2013 section 11.11 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3

4.5.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.5.2 Test Setup Diagram:



4.5.3 Test Data:

Please Refer to Appendix for Details.

4.6 Band edge emissions (Radiated)

Test Requirement:	Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Limit:	

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

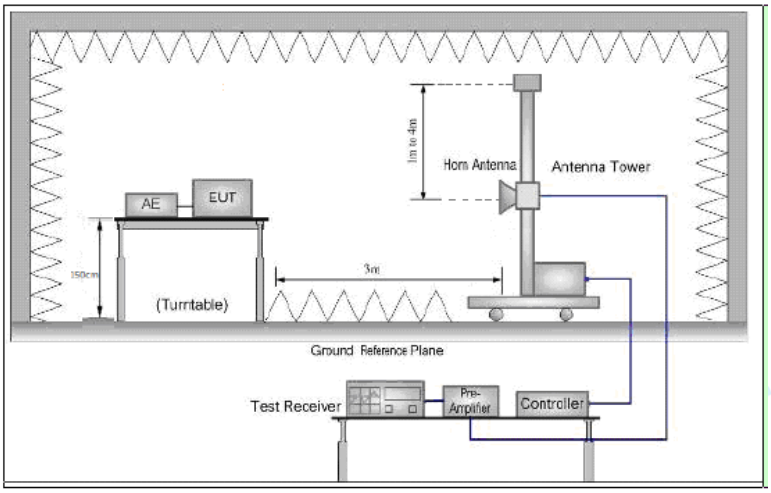
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Test Method:	ANSI C63.10-2013 section 6.10 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013 section 6.10.5.2

4.6.1 E.U.T. Operation:

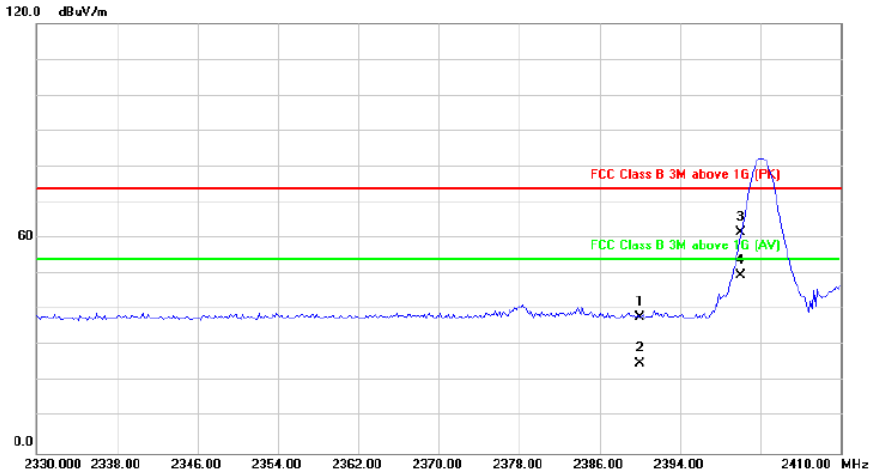
Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.6.2 Test Setup Diagram:



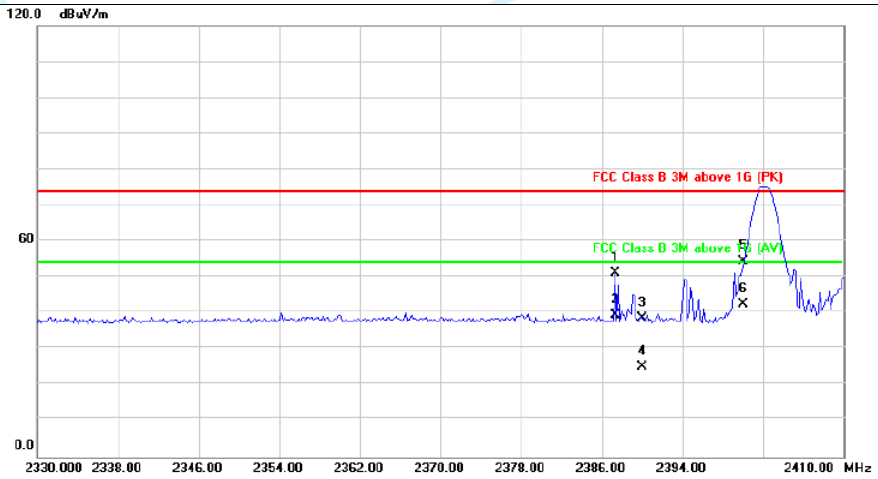
4.6.3 Test Data:

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: L



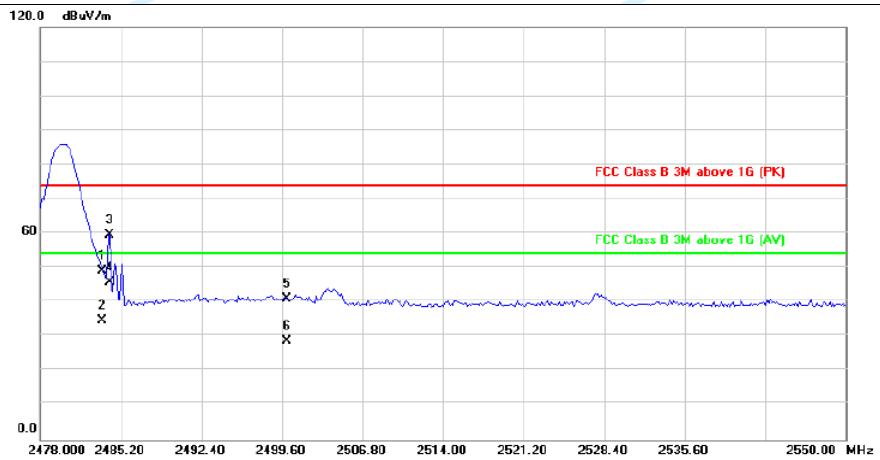
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2390.000	44.58	-6.72	37.86	74.00	-36.14	peak			
2		2390.000	31.87	-6.72	25.15	54.00	-28.85	AVG			
3		2400.000	68.27	-6.69	61.58	74.00	-12.42	peak			
4	*	2400.000	56.37	-6.69	49.68	54.00	-4.32	AVG			

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: L



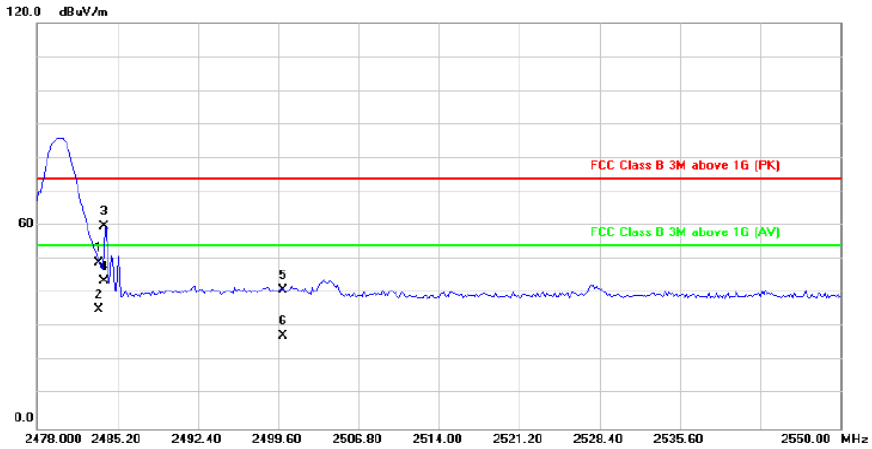
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2387.280	59.01	-7.92	51.09	74.00	-22.91	peak			
2		2387.280	47.49	-7.92	39.57	54.00	-14.43	AVG			
3		2390.000	46.38	-7.91	38.47	74.00	-35.53	peak			
4		2390.000	32.88	-7.91	24.97	54.00	-29.03	AVG			
5		2400.000	62.20	-7.87	54.33	74.00	-19.67	peak			
6	*	2400.000	50.44	-7.87	42.57	54.00	-11.43	AVG			

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2483.500	55.62	-6.47	49.15	74.00	-24.85	peak			
2		2483.500	41.09	-6.47	34.62	54.00	-19.38	AVG			
3		2484.192	66.12	-6.47	59.65	74.00	-14.35	peak			
4	*	2484.192	52.30	-6.47	45.83	54.00	-8.17	AVG			
5		2500.000	47.29	-6.43	40.86	74.00	-33.14	peak			
6		2500.000	35.04	-6.43	28.61	54.00	-25.39	AVG			

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		2483.500	55.62	-6.47	49.15	74.00	-24.85	peak			
2		2483.500	41.75	-6.47	35.28	54.00	-18.72	AVG			
3		2484.048	66.44	-6.47	59.97	74.00	-14.03	peak			
4	*	2484.048	50.13	-6.47	43.66	54.00	-10.34	AVG			
5		2500.000	47.29	-6.43	40.86	74.00	-33.14	peak			
6		2500.000	33.94	-6.43	27.51	54.00	-26.49	AVG			

Remark:

1.Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.

2. Over= Measurement Level - Limit

Measurement Level=Test receiver reading + correction factor

Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

4.7 Emissions in restricted frequency bands (below 1GHz)

Test Requirement:	Refer to 47 CFR 15.247(d), In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Limit:	

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

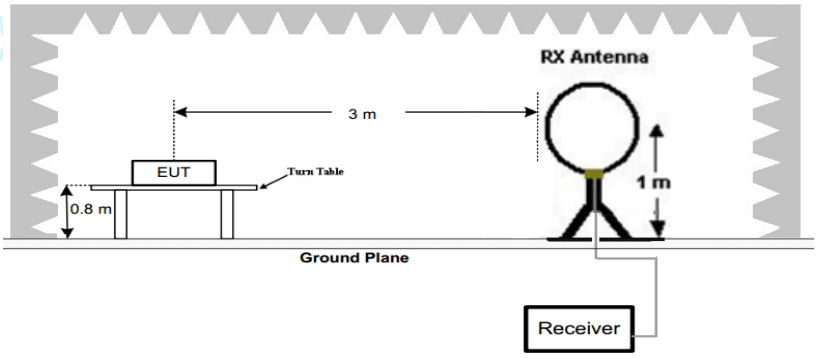
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

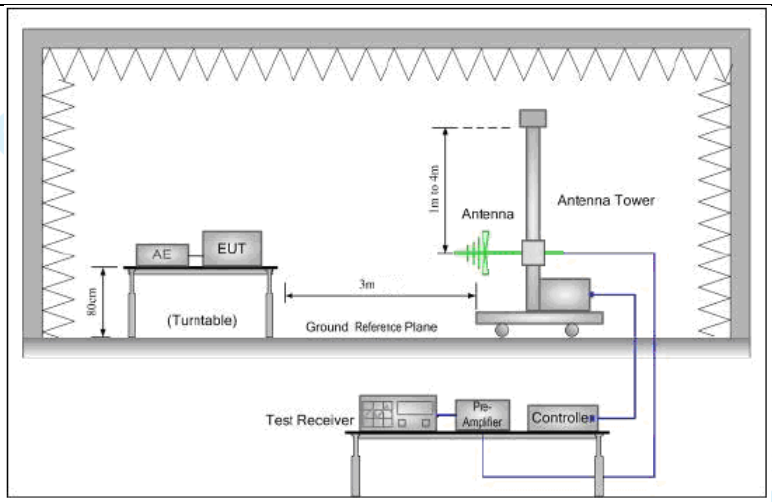
Test Method:	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013 section 6.6.4

4.7.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.7.2 Test Setup Diagram:





4.7.3 Test Data:

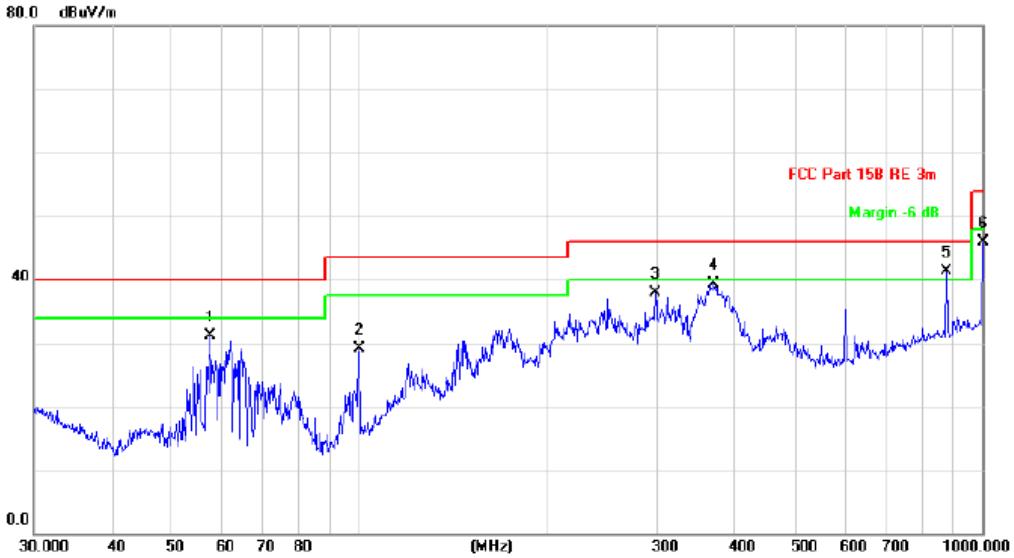
Between 9KHz – 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

NOTE:Test data only records the worst mode or worst channel.

Between 30MHz – 1000MHz

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		57.5939	40.90	-9.83	31.07	40.00	-8.93	QP	100	268	
2		99.8777	36.37	-7.32	29.05	43.50	-14.45	QP	100	62	
3		298.2681	39.99	-2.08	37.91	46.00	-8.09	QP	100	150	
4		370.7023	40.64	-1.26	39.38	46.00	-6.62	QP	100	208	
5	*	875.2470	33.67	7.67	41.34	46.00	-4.66	QP	100	142	
6		1000.0000	36.17	9.70	45.87	54.00	-8.13	QP	100	84	

TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1		30.1054	33.25	-2.03	31.22	40.00	-8.78	QP	100	266	
2		52.3912	41.74	-8.74	33.00	40.00	-7.00	QP	100	300	
3		146.3735	34.65	-4.29	30.36	43.50	-13.14	QP	100	65	
4		372.0045	37.21	-1.05	36.16	46.00	-9.84	QP	100	43	
5	*	601.4265	34.63	4.67	39.30	46.00	-6.70	QP	100	331	
6		1000.0000	36.72	9.10	45.82	54.00	-8.18	QP	100	154	

Remark: Over= Measurement Level - Limit
Measurement Level=Test receiver reading + correction factor
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

4.8 Emissions in restricted frequency bands (above 1GHz)

Test Requirement:	In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)(see § 15.205(c)).`
Test Limit:	

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100 **	3
88-216	150 **	3
216-960	200 **	3
Above 960	500	3

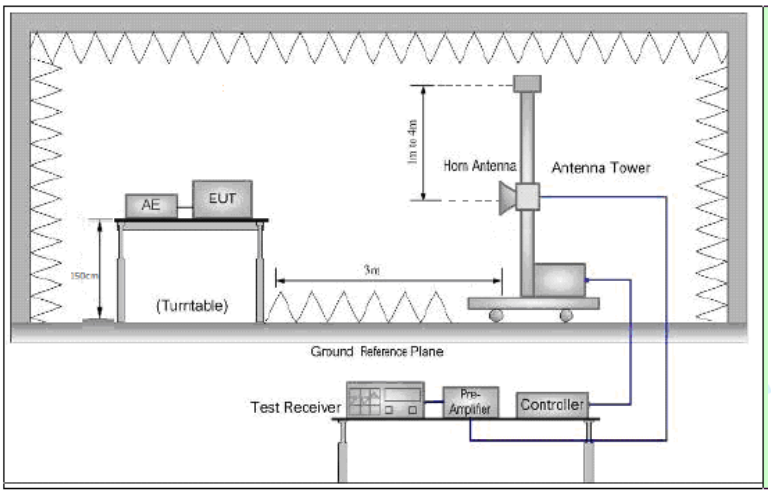
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Test Method:	ANSI C63.10-2013 section 6.6.4 KDB 558074 D01 15.247 Meas Guidance v05r02
Procedure:	ANSI C63.10-2013 section 6.6.4

4.8.1 E.U.T. Operation:

Operating Environment:					
Temperature:	22.6 °C	Humidity:	50.3 %	Atmospheric Pressure:	102 kPa
Pre test mode:	TM1				
Final test mode:	TM1				

4.8.2 Test Setup Diagram:



4.8.3 Test Data:

(Waveforms below the limit of 20dbm are not marked. The range greater than 18G only has background noise, so it is not recorded in the report)

TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H

Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4960	46.02	-0.9	45.12	74.00	-28.88	peak	H
4960	36.07	-3.04	33.03	54.00	-20.97	AVG	H
7440	47.94	1.35	49.29	74.00	-24.71	peak	H
7440	36.57	1.35	37.92	54.00	-16.08	AVG	H
4960	45.16	-2.37	42.79	74.00	-31.21	peak	V
4960	35.70	-2.37	33.33	54.00	-20.67	AVG	V
7440	46.62	1.42	48.04	74.00	-25.96	peak	V
7440	35.29	1.42	36.71	54.00	-17.29	AVG	V

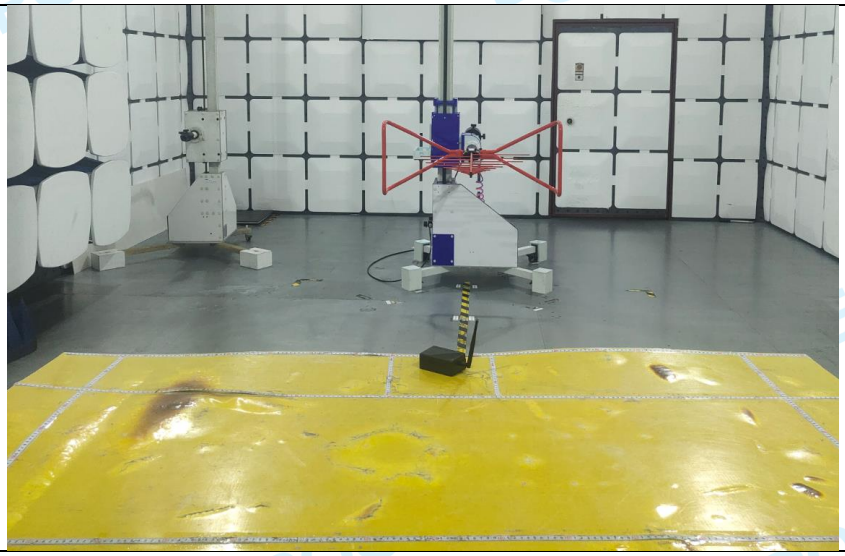
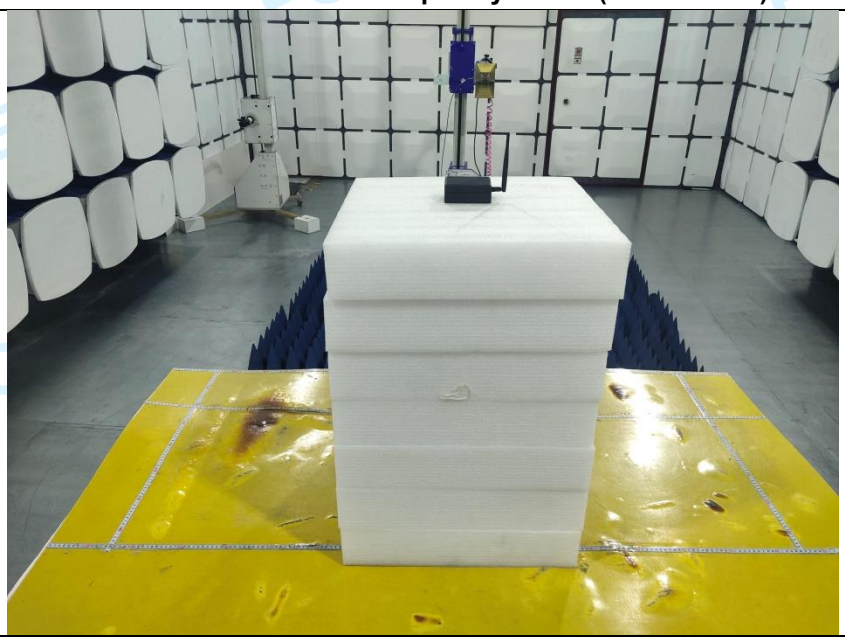
Remark: Over= Measurement Level - Limit
Measurement Level=Test receiver reading + correction factor
Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

Note:
Per ANSI C63.10-2013, if there are two or more antnnas, the conducted powers at Core 0, Core 1,…, Core i were first measured separately, as shown in the section above(this product olny have one antenna). The measured values were then summed in linear power units then converted back to dBm.

Sample Multiple antennas Calculation: Core 0 + Core 1 +…Core i. = MIMO/CDD
(i is the number of antennas)

(#VALUE! mW + XX mW) = #VALUE! mW = XX dBm
Sample e.i.r.p. Calculation:
XX dBm= Conducted Power (dBm) + Ant gain (dBi)

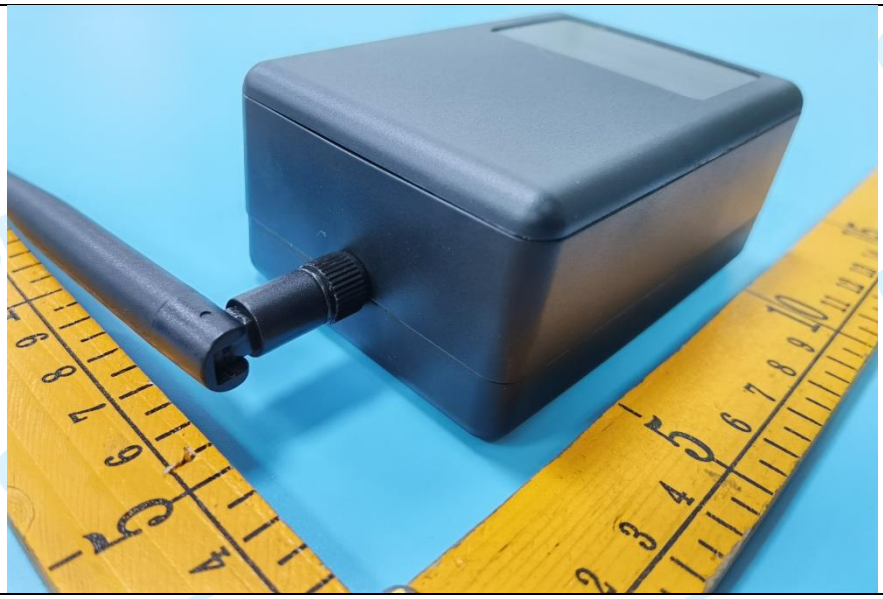
5 TEST SETUP PHOTOS

Emissions in restricted frequency bands (below 1GHz)

Emissions in restricted frequency bands (above 1GHz)


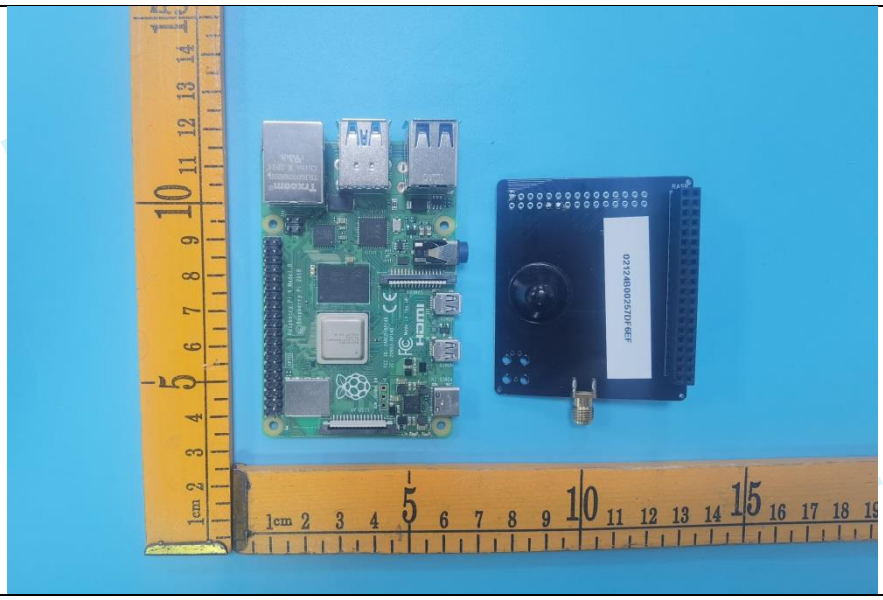
Conducted Emission at AC power line

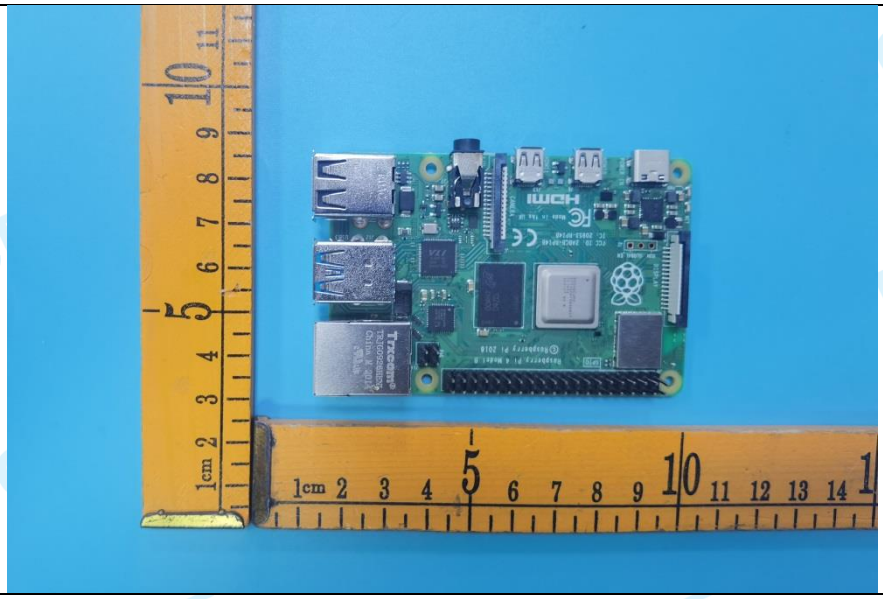
6 PHOTOS OF THE EUT

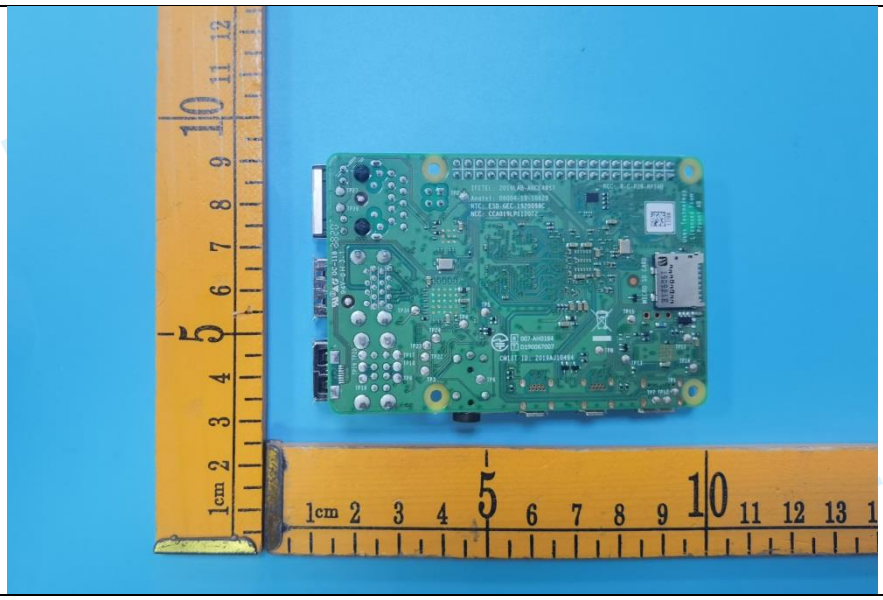
External



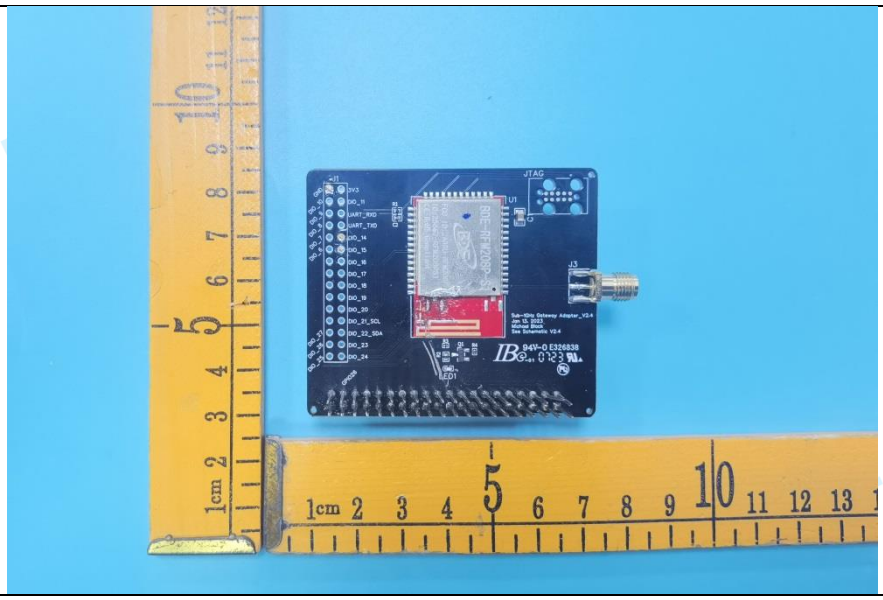
Internal

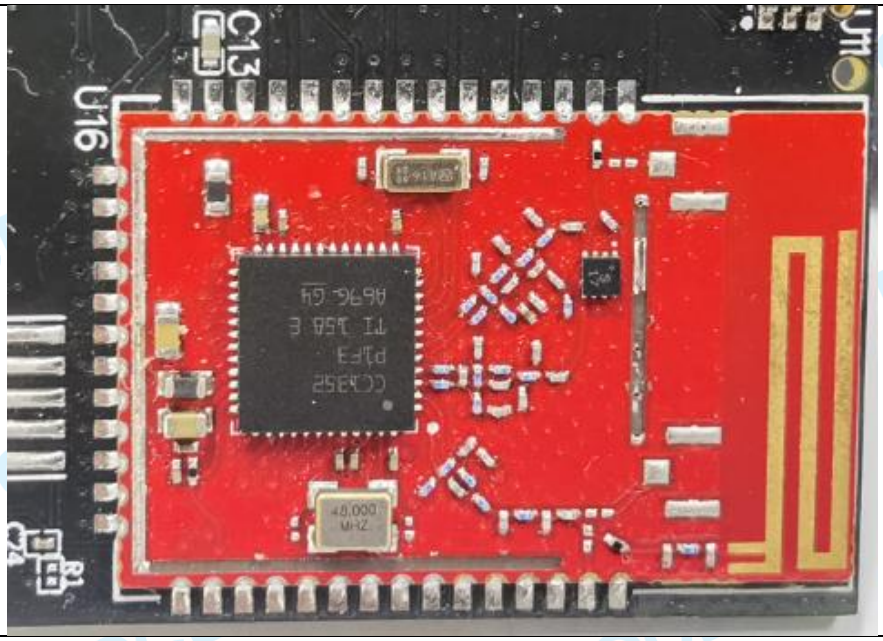






02124B00257DF6EF


JTAG
J3
1cm 2 3 4 5 6 7 8 9 10 11 12 13


C13
U16

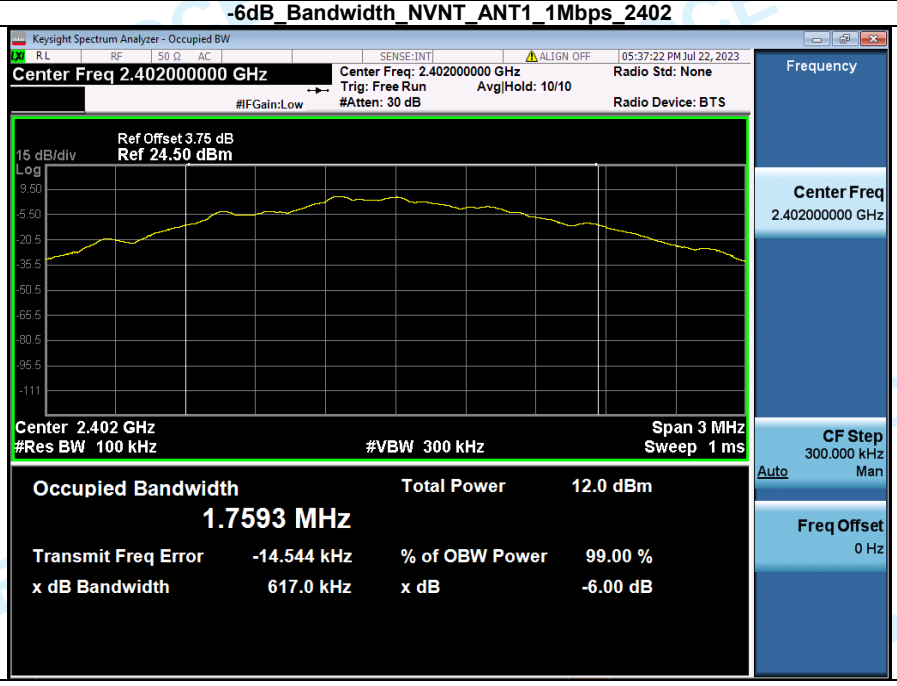
Appendix

FCC BLE Test Data

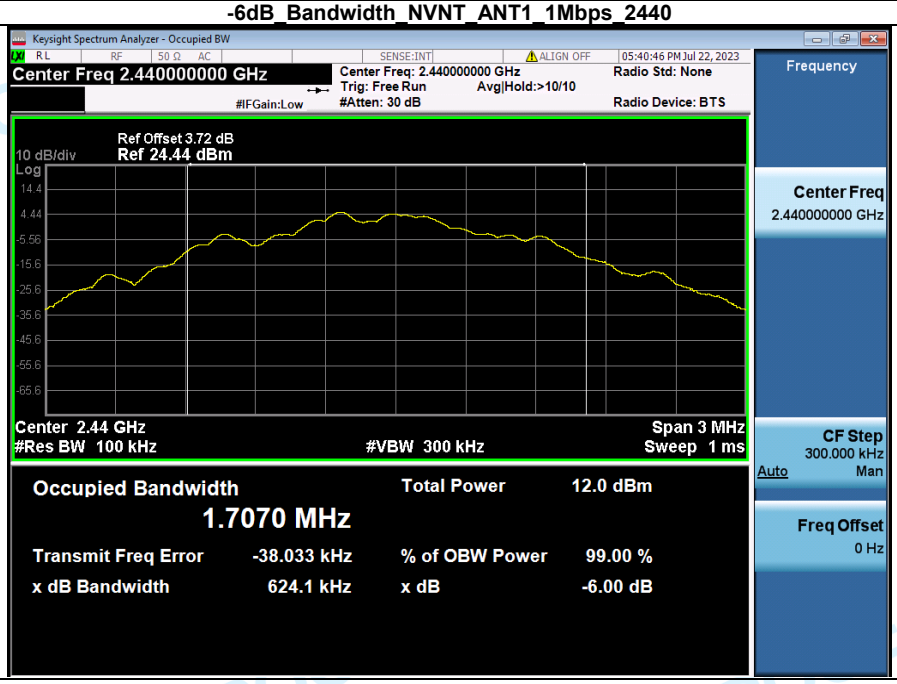
1.1 -6dB Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	-6dB BW(kHz)	limit(kHz)	Result
NVNT	ANT1	1Mbps	2402	617.0	500	Pass
NVNT	ANT1	1Mbps	2440	624.1	500	Pass
NVNT	ANT1	1Mbps	2480	650.5	500	Pass

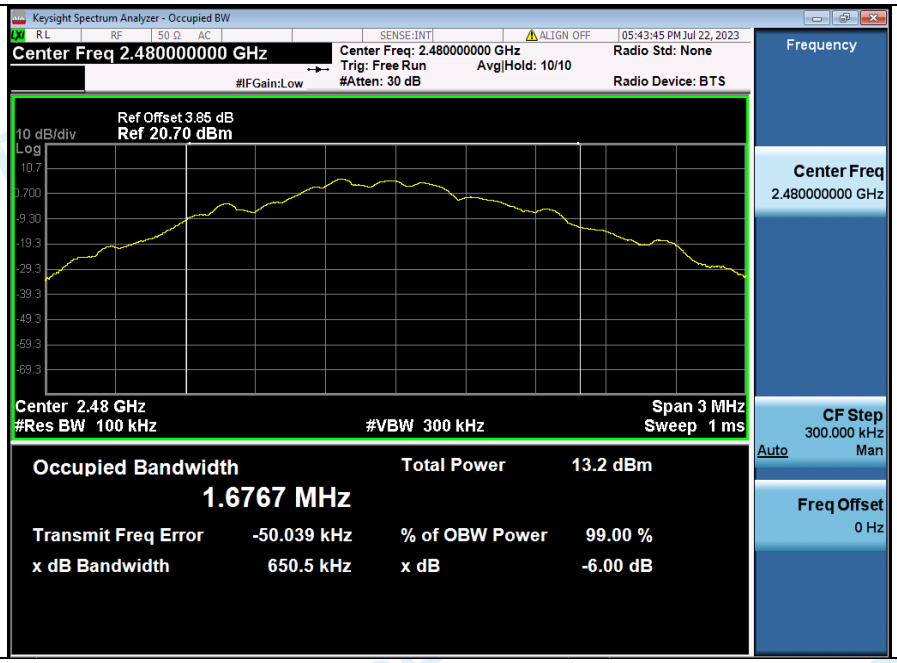
-6dB_Bandwidth_NVNT_ANT1_1Mbps_2402



-6dB_Bandwidth_NVNT_ANT1_1Mbps_2440



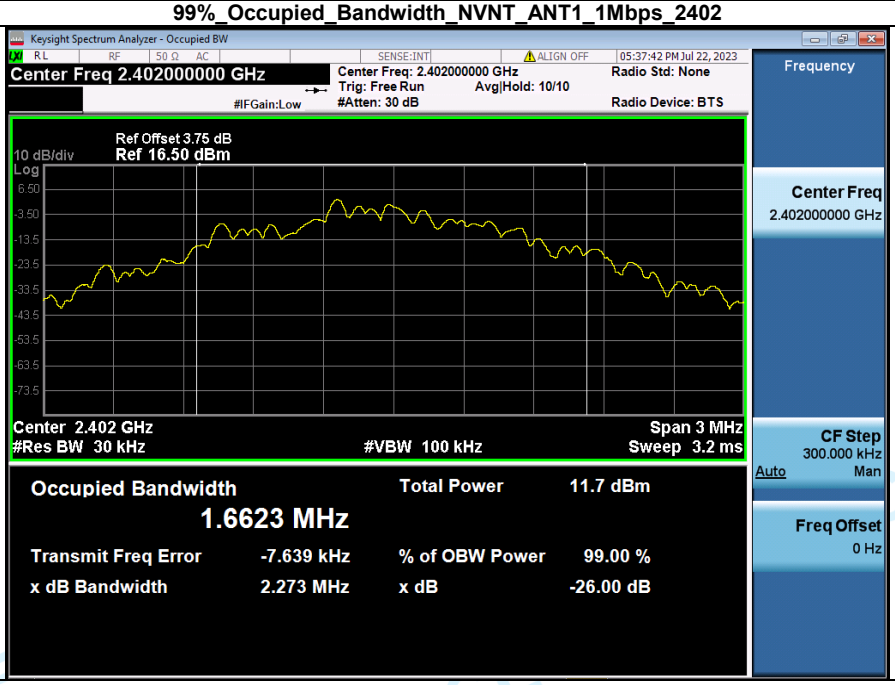
-6dB_Bandwidth_NVNT_ANT1_1Mbps_2480


Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold: 10/10
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
05:43:45 PM Jul 22, 2023
Frequency
Ref Offset 3.85 dB
10 dB/div
Ref 20.70 dBm
Center 2.48 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
1.6767 MHz
Total Power 13.2 dBm
Transmit Freq Error -50.039 kHz
% of OBW Power 99.00 %
x dB Bandwidth 650.5 kHz
x dB -6.00 dB
Center Freq
2.480000000 GHz
CF Step
300.000 kHz
Auto Man
Freq Offset
0 Hz

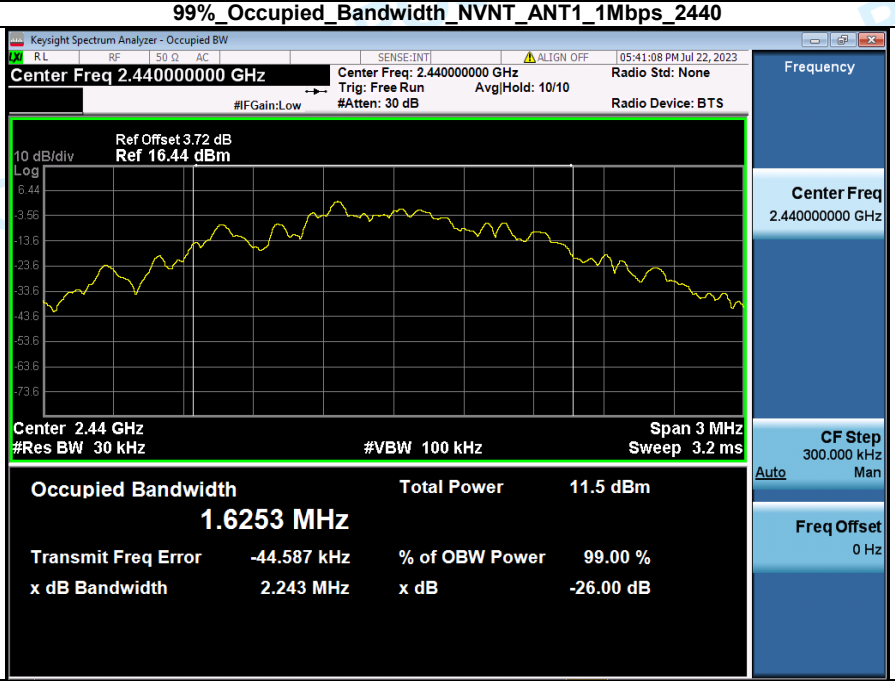
1.2 99% Occupied Bandwidth

Condition	Antenna	Rate	Frequency (MHz)	99%%BW(MHz)
NVNT	ANT1	1Mbps	2402	1.662
NVNT	ANT1	1Mbps	2440	1.625
NVNT	ANT1	1Mbps	2480	1.575

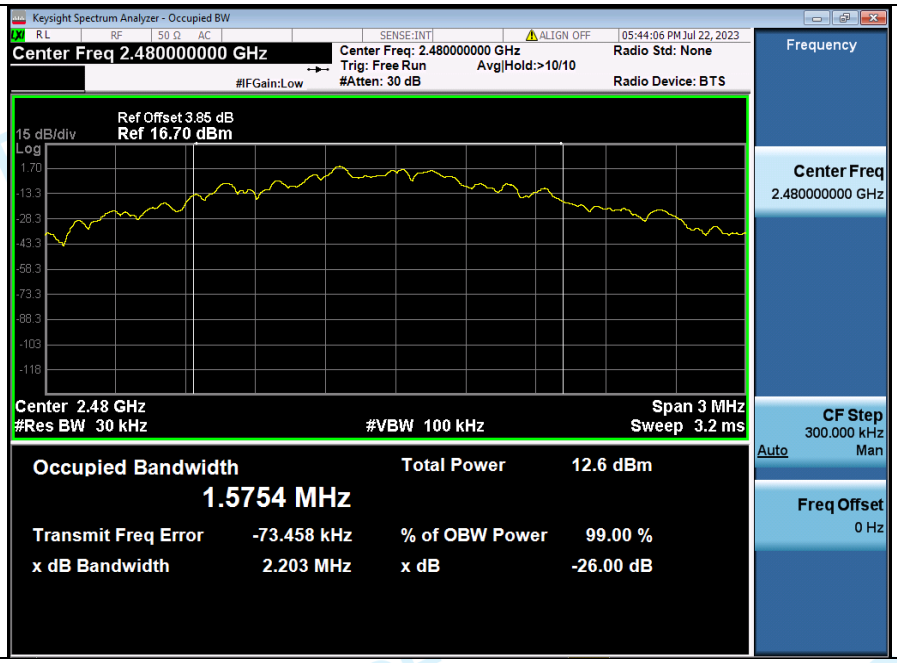
99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2402



99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2440



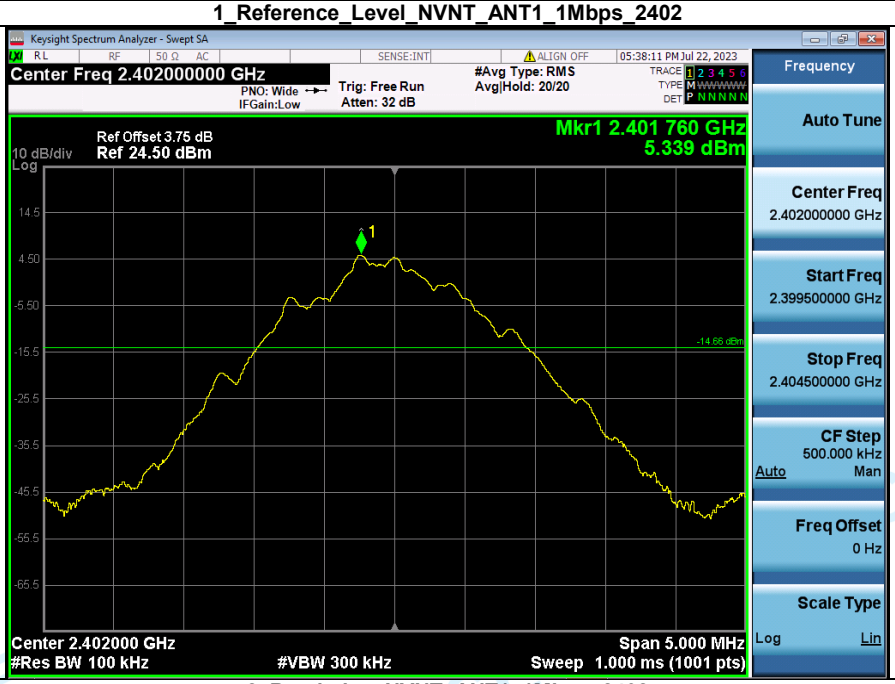
99%_Occupied_Bandwidth_NVNT_ANT1_1Mbps_2480


Keysight Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 30 dB
Radio Std: None
Radio Device: BTS
05:44:06 PM Jul 22, 2023
Frequency
Ref Offset 3.85 dB
15 dB/div
Ref 16.70 dBm
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.2 ms
Occupied Bandwidth
1.5754 MHz
Total Power 12.6 dBm
Transmit Freq Error -73.458 kHz
% of OBW Power 99.00 %
x dB Bandwidth 2.203 MHz
x dB -26.00 dB
Center Freq
2.480000000 GHz
CF Step
300.000 kHz
Auto Man
Freq Offset
0 Hz

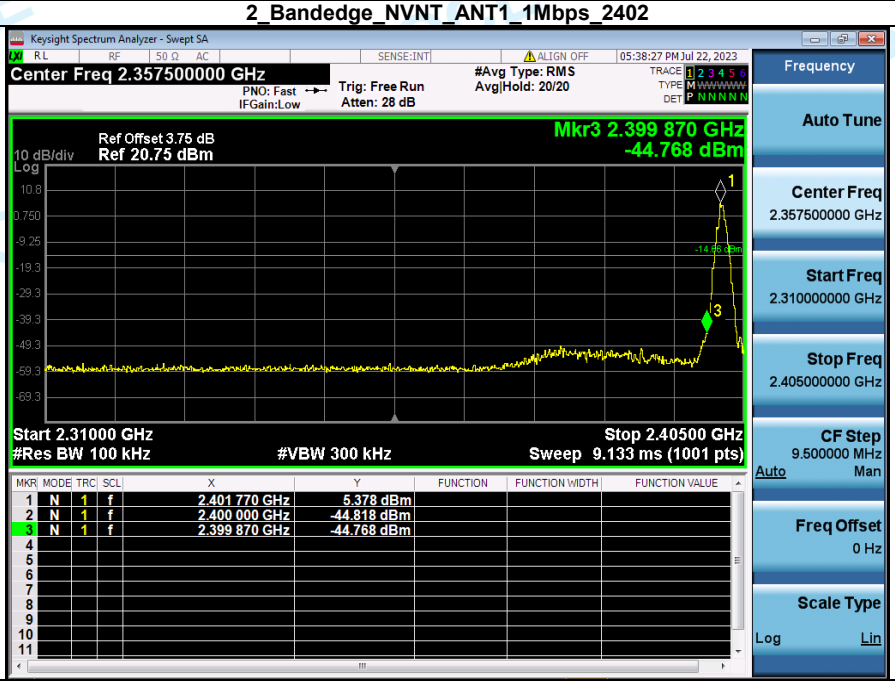
1.3 Bandedge

Condition	Antenna	Rate	TX_Frequency (MHz)	Max. Mark Frequency (MHz)	Spurious level(dBm)	limit(dBm)	Result
NVNT	ANT1	1Mbps	2402	2396.36	-44.768	-14.661	Pass
NVNT	ANT1	1Mbps	2480	2486.25	-46.361	-13.596	Pass

1_Reference_Level_NVNT_ANT1_1Mbps_2402

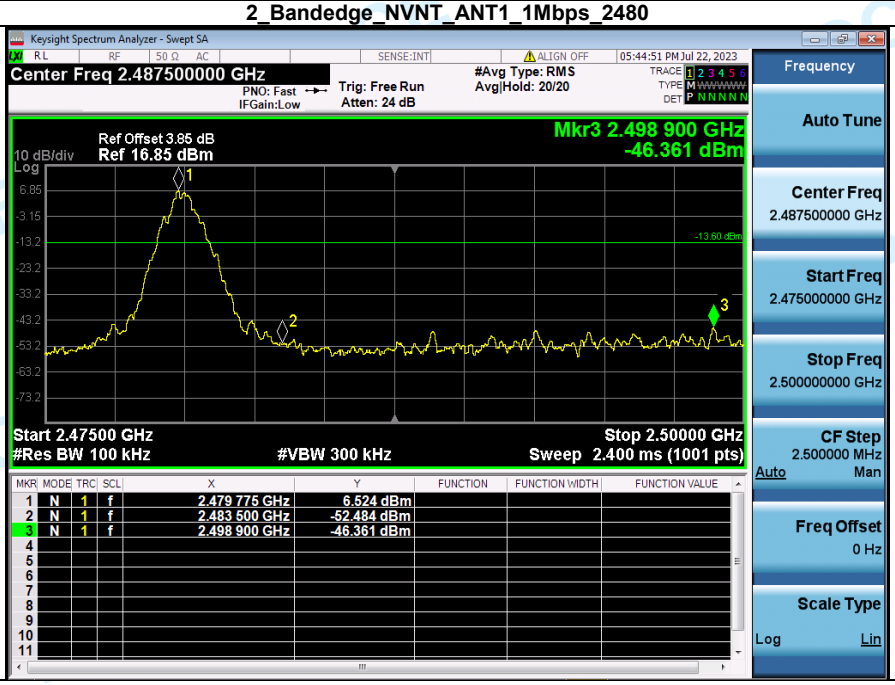


2_Bandedge_NVNT_ANT1_1Mbps_2402



1_Reference_Level_NVNT_ANT1_1Mbps_2480

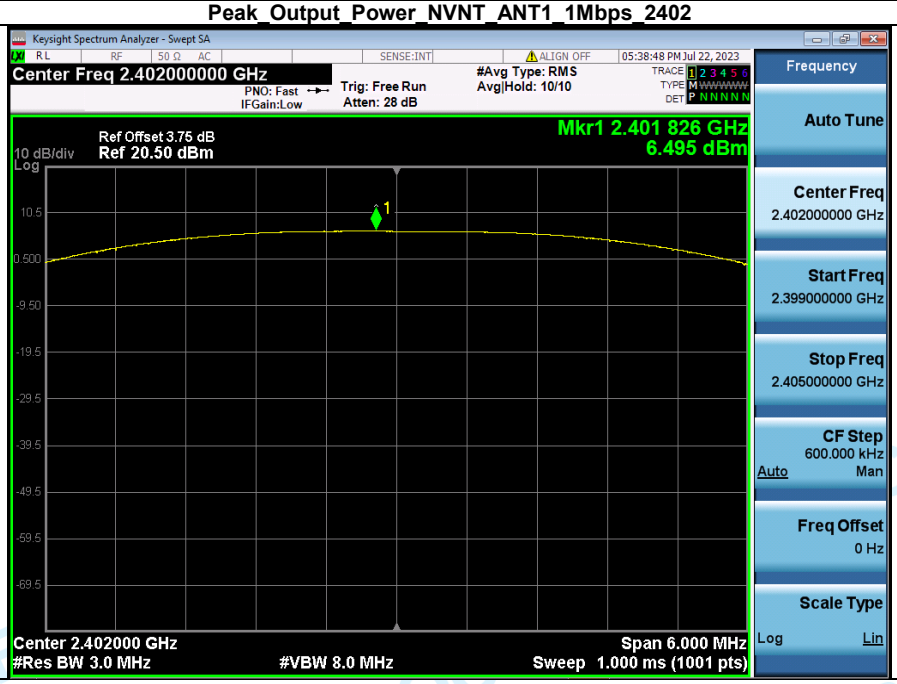
2_Bandedge_NVNT_ANT1_1Mbps_2480



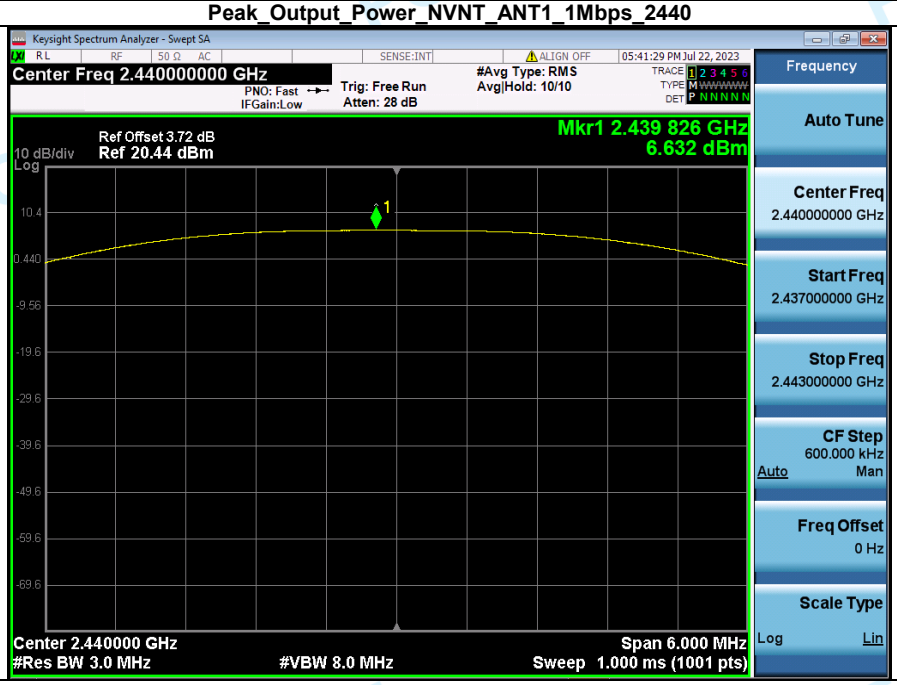
1.4 Peak Output Power

Condition	Antenna	Rate	Frequency (MHz)	Max. Conducted Power(dBm)	Max. Conducted Power(mW)	Limit(mW)	Result
NVNT	ANT1	1Mbps	2402	6.50	4.46	1000	Pass
NVNT	ANT1	1Mbps	2440	6.63	4.60	1000	Pass
NVNT	ANT1	1Mbps	2480	7.54	5.68	1000	Pass

Peak_Output_Power_NVNT_ANT1_1Mbps_2402



Peak_Output_Power_NVNT_ANT1_1Mbps_2440



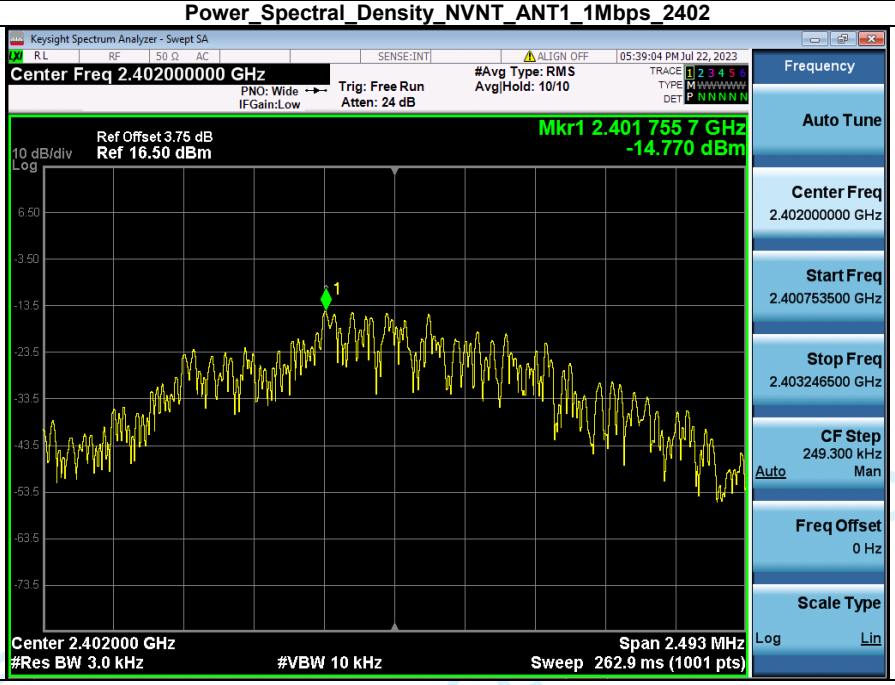
Peak_Output_Power_NVNT_ANT1_1Mbps_2480

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 34 dB
#Avg Type: RMS
Avg|Hold:>10/10
05:45:12 PM Jul 22, 2023
Ref Offset 3.85 dB
10 dB/div
Ref 26.70 dBm
Log
Mkr1 2.479 916 GHz
7.542 dBm
Center 2.480000 GHz
#Res BW 3.0 MHz
#VBW 8.0 MHz
Span 6.000 MHz
Sweep 1.000 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.477000000 GHz
Stop Freq
2.483000000 GHz
CF Step
600.000 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

1.5 Power Spectral Density

Condition	Antenna	Rate	Frequency (MHz)	Power Spectral Density(dBm)	Limit(dBm/3kHz)	Result
NVNT	ANT1	1Mbps	2402	-14.77	8	Pass
NVNT	ANT1	1Mbps	2440	-14.38	8	Pass
NVNT	ANT1	1Mbps	2480	-13.34	8	Pass

Power_Spectral_Density_NVNT_ANT1_1Mbps_2402



Power_Spectral_Density_NVNT_ANT1_1Mbps_2440

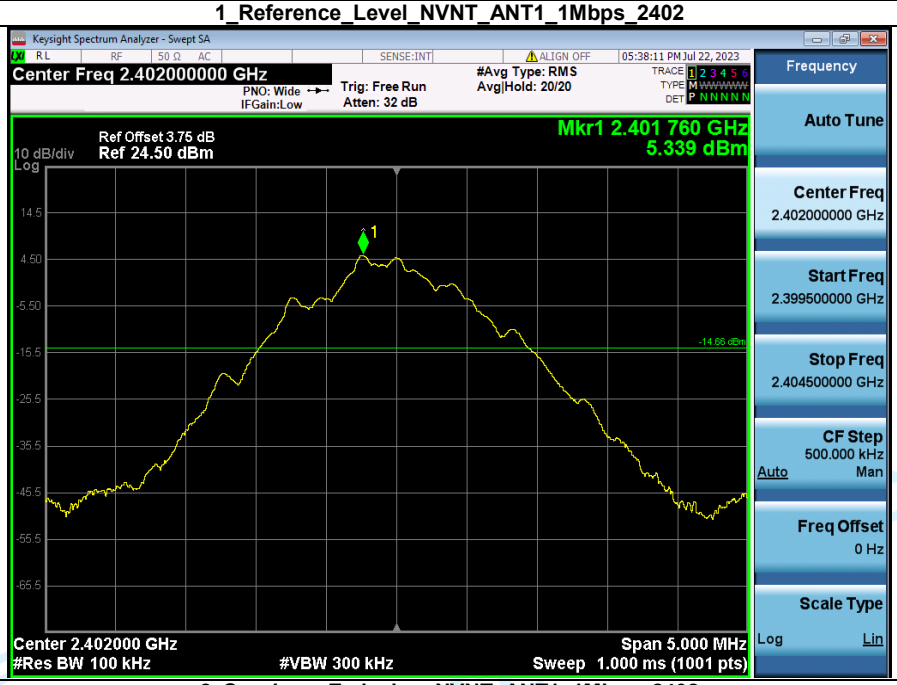
Power_Spectral_Density_NVNT_ANT1_1Mbps_2480

Keysight Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 22 dB
#Avg Type: RMS
Avg|Hold: 10/10
05:45:27 PM Jul 22, 2023
Ref Offset 3.85 dB
10 dB/div
Ref 14.70 dBm
Log
Mkr1 2.480 099 2 GHz
-13.342 dBm
Center 2.480000 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.363 MHz
Sweep 249.1 ms (1001 pts)
Frequency
Auto Tune
Center Freq
2.480000000 GHz
Start Freq
2.478818750 GHz
Stop Freq
2.481181250 GHz
CF Step
236.250 kHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

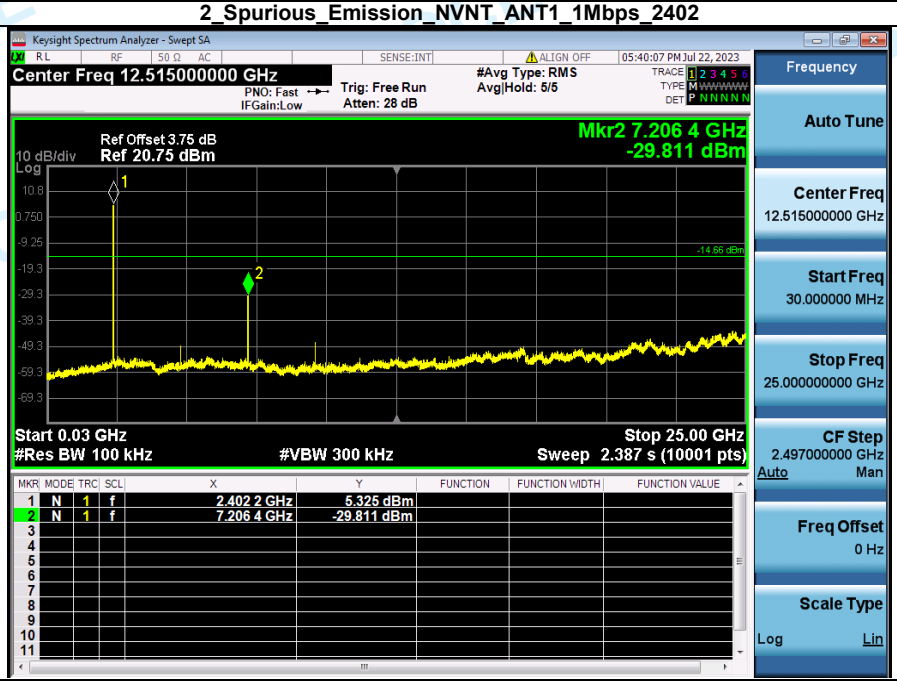
1.6 Spurious Emission

Condition	Antenna	Rate	TX_Frequency(MHz)	Spurious MAX.Value(dBm)	Limit	Result
NVNT	ANT1	1Mbps	2402	-29.811	-14.661	Pass
NVNT	ANT1	1Mbps	2440	-28.257	-14.640	Pass
NVNT	ANT1	1Mbps	2480	-25.531	-13.596	Pass

1_Reference_Level_NVNT_ANT1_1Mbps_2402

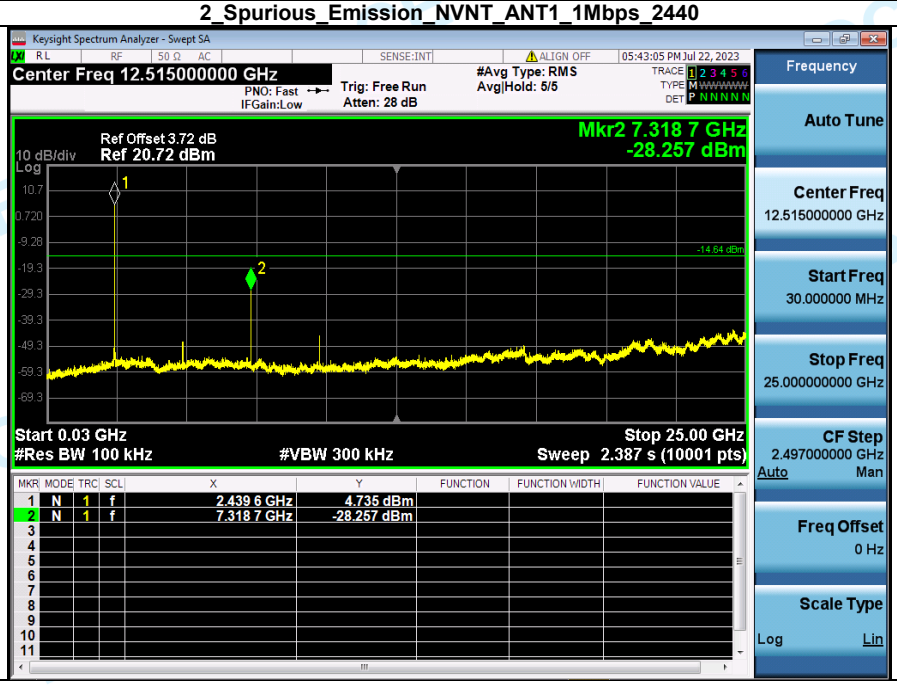


2_Spurious_Emission_NVNT_ANT1_1Mbps_2402



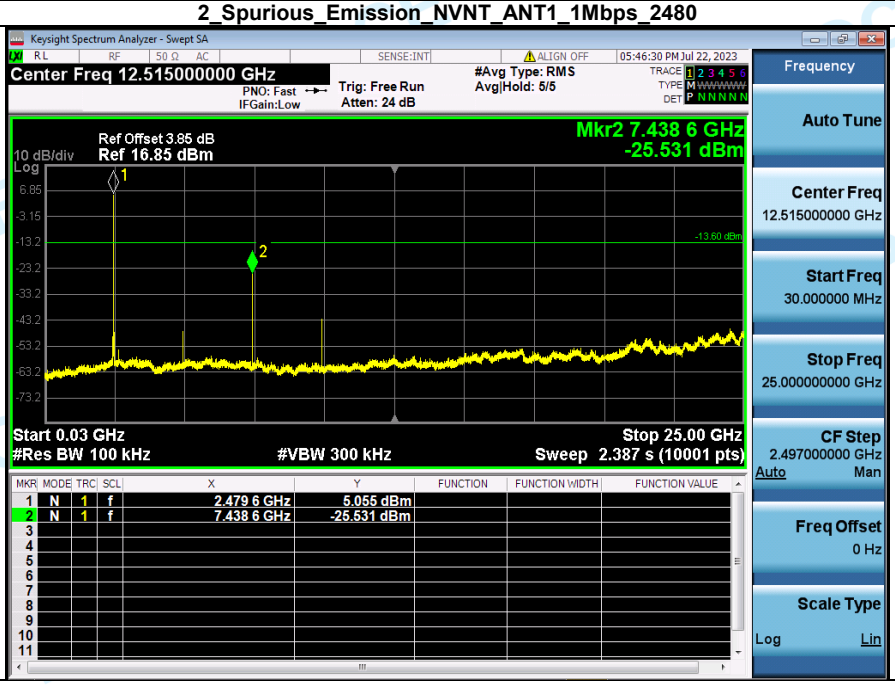
1_Reference_Level_NVNT_ANT1_1Mbps_2440

2_Spurious_Emission_NVNT_ANT1_1Mbps_2440



1_Reference_Level_NVNT_ANT1_1Mbps_2480

2_Spurious_Emission_NVNT_ANT1_1Mbps_2480



********** End of Report **********